De soortelijke warmte van ijzer, nikkel en hun onderlinge legeringen.

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SUMMARY

The specific heats of iron, nickel and iron-nickel-alloys at different temperatures have been studied in this thesis.

Firstly the results of the measurements of the specific heats of pure iron in a vacuum, between 100° and 1500° C., are described. Originally, a number of irregularities in the $\bar{c}_p$-t-curve were observed, which apparently correspond to those already found by NAESER. These irregularities proved to disappear, however, after the metal having been heated several times at high temperatures. The supposition, that these phenomena were due to gases, dissolved in the metal, was rendered more probable by consecutive experiments.

From the experimental data obtained in the case of pure, gasfree iron, the true specific heats c_p were deduced. The values were in complete accordance with the results obtained by KLINKHARDT, who used a direct method of measurement.

An abnormal increase of the specific heat starts already at temperatures, a hundred degrees below the CURIE-point. Moreover, a characteristic discontinuity in the specific heat-curve seems to occur at about 150° C., which cannot be ascribed to gases; the same discontinuity could also be stated in the measurements of the linear thermal expansion, of the thermo-electrical behaviour and of the electrical resistance, as a function of the temperature. No change of the crystalline structure at 150°—200° C. could be found by means of X-ray-spectrograms.

In the second part the specific heats of iron-nickel-alloys, with 10%, 20%, 30%, 40%, 50%, 70% and 80% nickel are dealt with.

The so called „reversible" alloys (with 40% nickel and more) prove to show an evident conformity of their $\bar{c}_p$-t-curves. On the contrary, the „irreversible" alloys (with 0—30% nickel) apparently manifest a deviating course of their specific heat-curves. An appreciable discontinuity was found in the $\bar{c}_p$-t-curves of alloys with 10% and 20% nickel at the $\gamma \rightarrow \alpha$-transition. An

alloy containing 30% nickel, displays strong retarding-phenomena at its phase-transition. The influence of cooling this alloy in liquid air was examined, and it appeared that the $\gamma \rightarrow \alpha$-transition is completed at a low temperature.

The true specific heats c_p were deduced from the measured values and compared for the different alloys, in order to discover the relations between their heat-content and their composition. The heat-content and the specific heat show a minimum at a composition of about 30% nickel; this is in agreement with the occurence of a minimal coëfficient of expansion in the case of *invar* (35% nickel).

The validity of the „rule of NEUMANN-KOPP", concerning the additivity of the specific heats in intermetallic compounds, was once more checked. In this case the rule proved to have an approximative validity, in agreement with the occurrence of solid solutions.

The specific heats of γ-iron within these alloys were calculated from the data obtained.

The relations between the changes in the specific heats of these alloys with the temperature and the situation of the boundary-curves within the diagram of the *Fe-Ni*-equilibria, were studied.

Finally, the microscopic structures of the alloys, used in this investigation, were compared with each other.